CLAIMS

1. A focus control device comprising,

sensor means for receiving light reflected from an optical disk and outputting a plurality of sensor signals;

error signal synthesizing means for arithmetically synthesizing the plurality of sensor signals and generating a focus error signal;

arithmetic means comprising an error input portion for generating a focus error value group based on the focus error signal, a disturbance addition portion for adding a first disturbance value group that has periodicity to the focus error value group that is generated by the error input portion and producing an output, a phase compensation portion for performing at least a phase compensation calculation and an amplification calculation according to an amplification calculation gain on the output of the disturbance addition portion and generating a drive value group, a drive output portion for generating a drive signal based on the drive value group, a response detection portion for detecting a detection complex amplitude value based on the focus error value group that is generated by the error input portion, a second disturbance value group that has the same periodicity as the first disturbance value group, and a third disturbance value group that has the same periodicity as the second disturbance value group and a phase that is shifted from a phase of the second disturbance value group, and a gain modification portion for modifying the amplification calculation gain;

driving means for outputting a driving current that is substantially proportional to the drive signal; and

a focus actuator for driving an objective lens according to the driving current,

wherein the gain modification portion modifies the amplification calculation gain based on the detection complex amplitude value, a

predetermined complex amplitude value, and a correction complex value for correcting the predetermined complex amplitude value, and

wherein a phase of the correction complex value is substantially identical to a phase of the first disturbance value group in the disturbance addition portion.

2. The focus control device according to claim 1,

wherein when the detection complex amplitude value is α, the predetermined complex amplitude value is β, and the correction complex value is γ,

the gain modification portion modifies the amplification calculation gain based on the value of $|\alpha/(\alpha + \beta \times \gamma)|$.

3. The focus control device according to claim 2,

wherein a numerical value group constituting a single cycle of the first disturbance value group is constituted by N disturbance values that are obtained by substantially equally dividing the time period of the single cycle,

wherein the phase of the correction complex value is substantially $-2\pi/N/2$, and

wherein a phase of the predetermined complex amplitude value is substantially 0.

4. The focus control device according to claim 2,

wherein the phase of the correction complex value is substantially $-2\pi/N/2$, and

wherein when a frequency of the first disturbance value group is fm and a processing time at the arithmetic means for generating the drive signal from the focus error signal is Td, a phase of the predetermined complex amplitude value is $-2\pi \times fm \times Td$.

5. A focus control device comprising,

sensor means for receiving light reflected from an optical disk and outputting a plurality of sensor signals;

error signal synthesizing means for arithmetically synthesizing the plurality of sensor signals and generating a focus error signal;

arithmetic means comprising an error input portion for generating a focus error value group based on the focus error signal, a disturbance addition portion for adding a first disturbance value group that has periodicity to the focus error value group that is generated by the error input portion and producing an output, a phase compensation portion for performing at least a phase compensation calculation and an amplification calculation according to an amplification calculation gain on the output of the disturbance addition portion and generating a drive value group, a drive output portion for generating a drive signal based on the drive value group, a response detection portion for detecting a detection complex amplitude value based on the focus error value group that is generated by the error input portion, a second disturbance value group that has the same periodicity as the first disturbance value group, and a third disturbance value group that has the same periodicity as the second disturbance value group and a phase that is shifted from a phase of the second disturbance value group, and a gain modification portion for modifying the amplification calculation gain;

driving means for outputting a driving current that is approximately proportional to the drive signal; and

a focus actuator for driving an objective lens according to the driving current,

wherein the gain modification portion modifies the amplification calculation gain based on the detection complex amplitude value, a predetermined complex amplitude value, and a correction complex value

for correcting the detection complex amplitude value, and

wherein a phase of the correction complex value is substantially identical to an antiphase of the first disturbance value group in the disturbance addition portion.

6. The focus control device according to claim 5,

wherein when the detection complex amplitude value is α, the predetermined complex amplitude value is β, and the correction complex value is γ,

the gain modification portion modifies the amplification calculation gain based on the value of $|\alpha \times \gamma/(\alpha \times \gamma + \beta)|$.

7. The focus control device according to claim 6,

wherein a numerical value group constituting a single cycle of the first disturbance value group is constituted by N disturbance values that are obtained by substantially equally dividing the time period of the single cycle,

wherein the phase of the correction complex value is substantially $2\pi/N/2$, and

wherein a phase of the predetermined complex amplitude value is substantially 0.

8. The focus control device according to claim 6,

wherein the phase of the correction complex value is substantially $2\pi/N/2$, and

wherein when a frequency of the first disturbance value group is fm and a processing time at the arithmetic means for generating the drive signal from the focus error signal is Td, a phase of the predetermined complex amplitude value is substantially $-2\pi \times fm \times Td$.

9. The focus control device according to claim 1 or 5,

wherein a numerical value group constituting a single cycle of the first disturbance value group is constituted by N disturbance values that are obtained by substantially equally dividing the time period of the single cycle, and

wherein the focus control device further comprises a storage portion for storing the N disturbance values.

10. The focus control device according to claim 1 or 5,

wherein the phase of the second disturbance value group is substantially identical to the phase of the first disturbance value group, and

wherein the phase of the third disturbance value group is shifted from the phase of the second disturbance value group substantially by $\pi/2$.

11. The focus control device according to claim 1 or 5,

wherein the response detection portion detects the detection complex amplitude value by referencing a plurality of focus error values that are input during a period of time that is an integral multiple of a cycle of the first disturbance value group.

12. The focus control device according to claim 1 or 5,

wherein a numerical value group constituting a single cycle of the first disturbance value group is constituted by disturbance values, the number of which is an integral multiple of 4, that are obtained by substantially equally dividing the time period of the single cycle.

13. A tracking control device comprising,

sensor means for receiving light reflected from an optical disk

and outputting a plurality of sensor signals;

error signal synthesizing means for arithmetically synthesizing the plurality of sensor signals and generating a tracking error signal;

arithmetic means comprising an error input portion for generating a tracking error value group based on the tracking error signal, a disturbance addition portion for adding a first disturbance value group that has periodicity to the tracking error value group that is generated by the error input portion and producing an output, a phase compensation portion for performing at least a phase compensation calculation and an amplification calculation according to an amplification calculation gain on the output of the disturbance addition portion and generating a drive value group, a drive output portion for generating a drive signal based on the drive value group, a response detection portion for detecting a detection complex amplitude value based on the tracking error value group that is generated by the error input portion, a second disturbance value group that has the same periodicity as the first disturbance value group, and a third disturbance value group that has the same periodicity as the second disturbance value group and a phase that is shifted from a phase of the second disturbance value group, and a gain modification portion for modifying the amplification calculation gain;

driving means for outputting a driving current that is substantially proportional to the drive signal; and

a tracking actuator for driving an objective lens according to the driving current,

wherein the gain modification portion modifies the amplification calculation gain based on the detection complex amplitude value, a predetermined complex amplitude value, and a correction complex value for correcting the predetermined complex amplitude value, and

wherein a phase of the correction complex value is substantially

identical to a phase of the first disturbance value group in the disturbance addition portion.

14. The tracking control device according to claim 13,

wherein when the detection complex amplitude value is α, the predetermined complex amplitude value is β, and the correction complex value is γ,

the gain modification portion modifies the amplification calculation gain based on the value of $|\alpha/(\alpha + \beta \times \gamma)|$.

15. The tracking control device according to claim 14,

wherein a numerical value group constituting a single cycle of the first disturbance value group is constituted by N disturbance values that are obtained by substantially equally dividing the time period of the single cycle,

wherein the phase of the correction complex value is substantially $-2\pi/N/2$, and

wherein a phase of the predetermined complex amplitude value is substantially 0.

16. The tracking control device according to claim 14,

wherein the phase of the correction complex value is substantially $-2\pi/N/2$, and

wherein when a frequency of the first disturbance value group is fm and a processing time at the arithmetic means for generating the drive signal from the tracking error signal is Td, a phase of the predetermined complex amplitude value is $-2\pi \times fm \times Td$.

17. A tracking control device comprising,

sensor means for receiving light reflected from an optical disk

and outputting a plurality of sensor signals;

error signal synthesizing means for arithmetically synthesizing the plurality of sensor signals and generating a tracking error signal;

arithmetic means comprising an error input portion for generating a tracking error value group based on the tracking error signal, a disturbance addition portion for adding a first disturbance value group that has periodicity to the tracking error value group that is generated by the error input portion and producing an output, a phase compensation portion for performing at least a phase compensation calculation and an amplification calculation according to an amplification calculation gain on the output of the disturbance addition portion and generating a drive value group, a drive output portion for generating a drive signal based on the drive value group, a response detection portion for detecting a detection complex amplitude value based on the tracking error value group that is generated by the error input portion, a second disturbance value group that has the same periodicity as the first disturbance value group, and a third disturbance value group that has the same periodicity as the second disturbance value group and a phase that is shifted from a phase of the second disturbance value group, and a gain modification portion for modifying the amplification calculation gain;

driving means for outputting a driving current that is approximately proportional to the drive signal; and

a tracking actuator for driving an objective lens according to the driving current,

wherein the gain modification portion modifies the amplification calculation gain based on the detection complex amplitude value, a predetermined complex amplitude value, and a correction complex value for correcting the detection complex amplitude value, and

wherein a phase of the correction complex value is substantially

identical to an antiphase of the first disturbance value group in the disturbance addition portion.

18. The tracking control device according to claim 17,

wherein when the detection complex amplitude value is α, the predetermined complex amplitude value is β, and the correction complex value is γ,

the gain modification portion modifies the amplification calculation gain based on the value of $|\alpha \times \gamma/(\alpha\times\gamma + \beta)|$.

19. The tracking control device according to claim 18,

wherein a numerical value group constituting a single cycle of the first disturbance value group is constituted by N disturbance values that are obtained by substantially equally dividing the time period of the single cycle,

wherein the phase of the correction complex value is substantially $2\pi/N/2$, and

wherein a phase of the predetermined complex amplitude value is substantially 0.

20. The tracking control device according to claim 18,

wherein the phase of the correction complex value is substantially $2\pi/N/2$, and

wherein when a frequency of the first disturbance value group is fm and a processing time at the arithmetic means for generating the drive signal from the tracking error signal is Td, a phase of the predetermined complex amplitude value is substantially $-2\pi \times fm \times Td$.

21. The tracking control device according to claim 13 or 17,

wherein a numerical value group constituting a single cycle of the

first disturbance value group is constituted by N disturbance values that are obtained by substantially equally dividing the time period of the single cycle, and

wherein the tracking control device further comprises a storage portion for storing the N disturbance values.

22. The tracking control device according to claim 13 or 17,

wherein the phase of the second disturbance value group is substantially identical to the phase of the first disturbance value group, and

wherein the phase of the third disturbance value group is shifted from the phase of the second disturbance value group substantially by $\pi/2$.

23. The tracking control device according to claim 13 or 17,

wherein the response detection portion detects the detection complex amplitude value by referencing a plurality of tracking error values that are input during a period of time that is an integral multiple of a cycle of the first disturbance value group.

24. The tracking control device according to claim 13 or 17,

wherein a numerical value group constituting a single cycle of the first disturbance value group is constituted by disturbance values, the number of which is an integral multiple of 4, that are obtained by substantially equally dividing the time period of the single cycle.